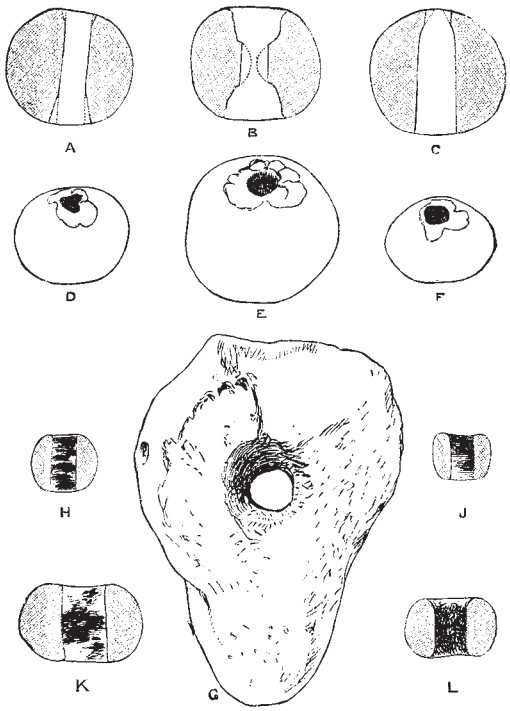
may have taken place in a manner similar to that of the formation of coal."

On testing the beads, which consist chiefly of carbonate of lime or chalk, without the black material in the orifice, the chemist reported that, "when treated in the same manner as those originally sent, they show the presence of a considerable amount of heterogeneous or animal organic matter, as was to be expected from their origin—but not, I think, so much as those with the black deposit."



Palæolithic Bead Ornaments (*Coscinopora globularis*, D'Orb.), showing traces of the original ligament and artificial enlargement.

Mr. A. Clarke, analytical chemist of Huddersfield, who also made an analysis for me, reported as follows :—

"I divided the bead into three portions. No. 1. The thin dark crust forming the internal portion of the ring; this is most certainly organic matter. No. 2. A powdery part between No. 1 and the main body of the ring, consisting of small quantities of carbonates of iron and lime. No. 3. The outer main body of the ring, mostly carbonate of lime, and a small quantity of silica; here there is only a trace of organic matter, but it is most distinctly present."

WORTHINGTON G. SMITH

IS IKTIS IN CORNWALL, AND DID IRON AND COPPER PRECEDE TIN?

AT Penzance on October 19, 1883, I asserted that the invention of tin-smelting was Cornish, but disputed the claim of St. Michael's Mount to be the sole claimant to the title of Iktis, the tin-shipping port described by Diodorus Siculus 1800 years ago, and I thought the inventions of metals were in this order: (1) iron, (2) copper, (3) tin. We may consider the Romans invaded Britain purposely to obtain its metals, which were then worked extensively by the British inhabitants. I believe the Romans either adopted Celtic names of places or things, or translated their meaning. I find the Cornish district, or Land's End, described by Ptolemy the geographer in the second century as "Belerium," that is the land of mines, "bal" being Cornish for a mine. The word is also met with in Irish. In the same manner the skin boats used by the Cornishmen, which so much astonished the Greek travellers, were described by the Greeks under the name of "coracles," evidently a Celtic word from the Celtic root "cren" or "croen," skin. So tin, I think, is derived from the Irish word "teine," Welsh "tan," teine probably also expressing brightness. Even in the Malay Peninsula, in the East Indies, a word of similar sound, "timah," still stands for "tin," and not the Greek term for that metal "kassiteros."

Then the Cornish term "iarnn," for iron is similar to English "iron," German "Eisen," Welsh "haiarn," Greek "seiderion," in which *ei* is the important syllable. The Latin word "ferrum" is probably a form of "ierrum," and the Sanskrit "ayas" is for iron, metal. Nearly the same word for iron is therefore used in all the Aryan languages, while "æs" or "kalkos" stands for bronze or copper, and has only a comparatively local extension. The wide spread of the name for iron, or *ei*, is important, as it points to iron being the metal made before the division of the Aryan race, and therefore before copper or tin.

There is another and I believe new argument. The most easy process of copper-smelting, which even now is largely used, may have been the only plan known in prehistoric times. To use this process it was necessary to provide iron to precipitate copper from solution. At the present time 6000 tons of iron are sent annually to the Rio Tinto mines in Spain from Great Britain in order to precipitate the copper from solution.

It is possible that the discovery of the art of producing crude iron, which would be useful for precipitating copper, may have preceded the invention of bronze, and yet the art of forging difficult pieces may have been a later invention than that of casting bronze celts in metal moulds.

Iron, if not steel, appears to have been made in Egypt both in hearths and in crucibles certainly before 3124 B.C., but bronze was more used in Greece up to 650 B.C. than iron.

The smith in the sagas and folklore is the important person, not the caster or founder of bronze weapons. Why was the smith so important? Because he melted the small particles of gold found in the streams into small lumps, and with his hammer drew them out into wire and thin plates. Gold was made in such small quantities that it did not require large crucibles such as would be necessary for bronze. As iron was made by a simple welding or forging process, its production appears to be a more ancient art than bronze casting, which required large crucibles and mixing in exact proportions with tin, a process more difficult than in the infancy of metallurgy was likely to be invented. Then one ore of iron, ochre was the first metallic ore collected, long before the discovery of any of the metal. Ochre is found collected for use as a paint to ornament the cave men in the Palæolithic period, and is associated with limestone and charcoal. Accident in the fire might have thus led to the discovery of metallic iron in very early times. Such particles of iron placed in a certain stream in the Island of Anglesea (an early peopled district) would precipitate the copper in solution in that stream in a state of pure copper ready to mix with tin to make bronze.

Another point of great interest in this question is the position of Roman roads, proving a prior metallurgical trade, and therefore some considerable civilisation. The Romans erected their Roman villas and camps always near Roman roads, and these roads appear always arranged for military or metallurgical purposes, never for protecting agriculture, or levying imposts on the Britons. There is historical evidence that the Romans did not introduce metallurgy into Britain.

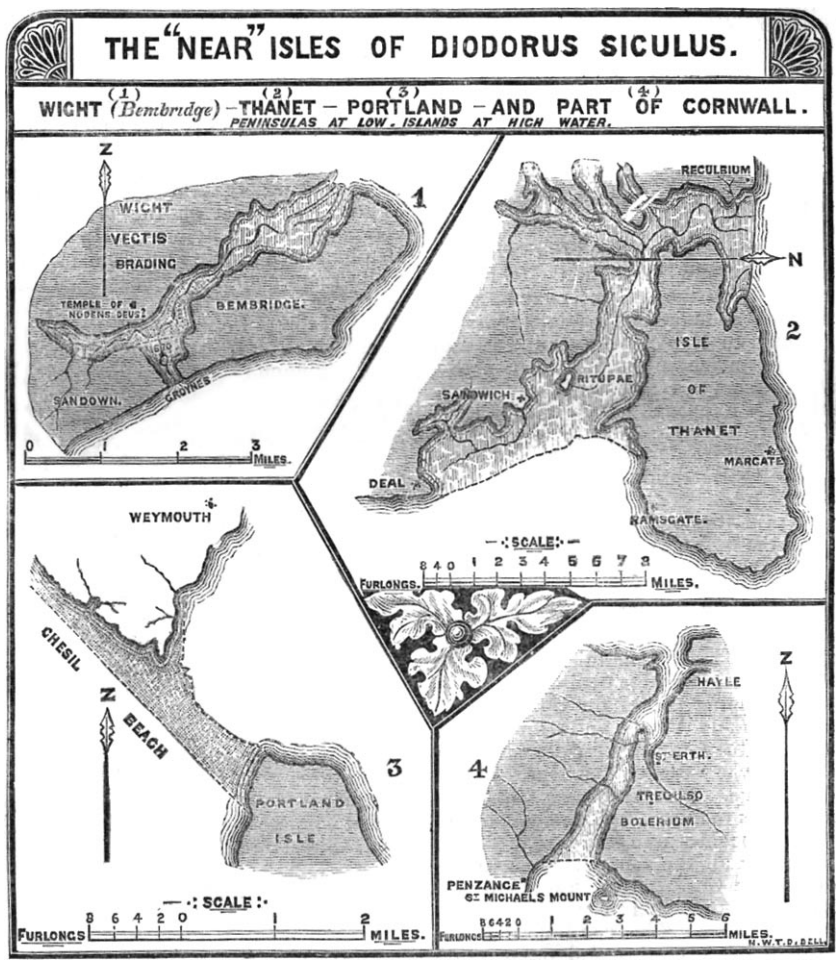
We may observe there is a great concentration of Roman roads at Winchester (Venta Belgarum). Roads meet at the point of junction from Exeter with this town, for bringing Cornish or Dartmoor tin, or lead and iron from the Mendips, to the Hampshire coast; iron from

South Wales, and lead from North Wales. There were, near Winchester, several great ports for Continental trade, viz. Magnus Portus (Portsmouth), Trisantonis and Clausentum (Southampton). Winchester is near Beaulieu. Below Beaulieu, six miles, is Stansoar (stone) Point, from "stannum," tin. This is nearly opposite Gurnard's Bay (Gubernators, across the Solent two miles), where there are remains of Roman villas. Thence to Newport and Brading, where the great Roman discoveries have been recently made. Among the "Islands of Britain" Ptolemy gives one as "Vectis," in Celtic Wyth.

Now Vectis has been hitherto treated as if it were only the name of an island, the Isle of Wight; but vectis is really the Latin term for a bolt, or security, and was probably applied to harbours, and is a translation of "Gwyth." A lock means also a canal lock.

If Prof. Rhys is right,[1] that "Ictis" and "Itius" are the same word, we may go further and say that the Portus Itius, from which Cæsar started from Britain, containing his 800 ships, was merely a technical term for a vectis or secure harbour attached to a town, such as that at the mouth of the Liane (Boulogne). It is only a century and a half since the natural basin of Boulogne has been partly filled up by the sea sand, and there was an estuary supplied by the Liane stream at the time of Cæsar, not unlike those drawn by me in shape, but without a through passage.

In fact, not only along the English coast, where



Dungeness Beach has blocked up the Roman Port Lymne, and the points where four islands have been joined to the mainland, as shown in the drawings, Figs. 1, 2, 3, and 4, but on the French coast great changes have been made by the same causes. At Sangatte and Calais, Wissant, Ambleteuse, Boulogne, St. Michael's Mount, and in fact at many places along the coast of the Pays Bas, the same filling up can be observed.

Cæsar's port of embarkation, Portus Itius, may have been named in the same sense as, according to Prof. Rhys, the old Irish wrote of the English Channel, viz. as Muir an Icht, which he renders the Sea of Icht, and which, according to the view I suggested, would be the sea of the passage, evidently a different meaning, although from the same roots, to the name, which, with the addition of Portus, we find in Cæsar. The term Portus Itius evidently was applied by the Roman writers to the harbour of Boulogne, although the city itself was called Gessoriacum. I think this philological explanation and the fact of the distance from Portus Itius (given by Strabo) thirty miles to Britain, removes every difficulty in the way of settling the position of the port from which Cæsar started. Of course the term Portus Itius might also apply to St. Valery-sur-Somme, where a passage has been partly closed, as at Marazion, in the historical period, but the distance given by Strabo is against it. Species of mollusks are found at both places, Marazion and St. Valery, not now living on the coast, and probably

[1] In a letter to A. Tylor, November 6, 1883.

these estuaries or passages were only entirely open in the Crag period.

I have said Vectis is equivalent with the Celtic word "gwyth," a passage. Now there is a closed passage or haven (a gwyth, or vectis, or iktis) from Sandown to Bembridge in the Isle of Wight (Fig. 1). From this passage the whole island gets its name "Gwyth" in Celtic, Latin "Vectis," Saxon "Wiht," English "Wight," never spelt "White," although it has white chalk cliffs.

The safety of any of the harbours called Vectis or Iktis arose from the fact of these islands (or parts of them) near the coast of Britain being peninsulas at low water and islands at high water. These were, therefore, typical natural harbours. The Greek writers, Diodorus Siculus and others, insist particularly upon this property of change with the tide. The remarkable tide contrasted strongly with the different circumstances in the Mediterranean. Now the prevailing winds on the south coast of England have caused modern beaches to form, particularly at all of these four passages on the south coast of England, and many of the passages have been closed, as we know, in the historical epoch. Their ancient form is clearly shown in my woodcut. Now the sea is entirely shut out by modern beaches and works.

The drawings show the changes which have occurred in Fig. 1, the Isle of Wight. Fig. 2 is the passage between the Isle of Thanet and Kent, closed in the historical period between Ritupæ and Regulbium. In Fig. 3, the Chesil Bank, has filled up the old waterway between the Isle of Portland and the mainland. Fig. 4, passage from St. Michael's Mount to Hayle. Gravel and stream tin-drift, closing up the ancient passage from near St. Michael's Mount at Marazion to Hayle.

The type of all that has happened is well seen, Fig. 1, Vectis, the Isle of Wight. Even in 1670 there was only a groyne and a small alluvial deposit near Sandown. Nearly all the passage to Bembridge was an estuary; now it is nearly all dry land.

The term "vectis" in Latin, or "iktis" in Greek, was no doubt applied to all the passages in these four islands.

The Cornish tin no doubt came in coracles, and by land on horses, to Magnus Portus or to Stansoar Point for shipment to Brading, and was shipped from these Hampshire ports and Isle of Wight ports to the banks of the Seine, to be carried on horseback in thirty days to Marseilles. Thus both the Bembridge peninsula and St. Michael's Mount were shipping places for tin, and both were properly called Iktis and Vectis, and as usual we find there was no error in the Greek observations.

Then as to the period when the contour lines of the south coast began to change. The Crag period was that in which the great estuaries round the British coast began to be filled up. Then pebbles and sand were driven along the coast. I believe all the four channels in the drawing, were open in the Crag period, and gradually closed up in the long period which intervened between the Crag and the present time. The continuous filling up has also occurred in the estuaries and passages on the opposite coast of the English Channel. It is probable that Portus Itius, at Gessoriacum? (Boulogne) obtained its name in a similar manner to Vectis and Iktis as I have already stated.

We find pure iron B.C. 3124 in Egypt. If iron was a necessity for the production of copper, and the metal tin was of no use without copper, we may place the inventions of the metals in the following order: (1) iron, (2) copper, (3) tin.

A. TYLOR

THE BEN NEVIS OBSERVATORY

SINCE the formal opening of the Observatory on October 17, workmen have been engaged in fitting up and finishing the interior, and pushing forward the provisioning of the establishment with tinned meats, biscuits, tea, coffee, &c., capable of lasting for six months, with fuel for a like period. Nothing that could be thought of has been left undone to render the observers as comfortable as possible during the winter. The telegraph cable is now in working order from the Observatory to Fort William, so that communication is always possible with the outer world. Mr. Omond, the superintendent, and his two assistants took up their residence on the top of the Ben about a fortnight ago; and it is extremely gratifying to learn that the building, every part of which during erection, and for some time after being roofed over, was soaked with water, is now thoroughly dry; the walls, roof, and windows have been officially inspected, and found to be perfectly tight in every respect; and in corroboration of this, during the storm of Thursday, the 8th inst., none of the finer snow particles of that elevated region entered the dwelling. As an additional protection against the severe weather which may happen, a large roll of tarpaulin, thirty-five feet long, was carried on the shoulders of twelve men to the top on Monday last week, and securely fixed over the roof of the building.

In a letter dated the 14th inst., Mr. Omond states that the Sunday previous was one of the finest days he ever saw; that Monday and Tuesday were nearly as good; and that on the Wednesday only the distant view was shut out by haze. Up to that date the top of the Ben had been all but free from stormy weather; indeed, while tempestuous weather raged below, the wind rose to a gale only on Thursday the 8th. A telegram was received direct from the Observatory on Thursday last week, which stated that the temperature for the day had been minimum 17° and maximum 28°, while inside the Observatory the temperature was 55°, which happened to be exactly the temperature of the Scottish Meteorological Society's office in George Street at the time.

A meeting of the directors was held at Edinburgh on the 15th inst., Sir William Thomson in the chair, at which Dr. Sanderson, the Treasurer, reported that the subscriptions now intimated amounted to a little over 5000*l.*, nearly three-fourths of which sum had been subscribed since the middle of May last.

A scheme of work for the coming winter, consisting of hourly observations by night as well as by day, was agreed upon. The observations include the barometer; dry, wet, maximum, and minimum thermometers; direction and force of the wind; rain, sleet, snow, and hail; evaporation from snow; species, direction, and velocity of upper and lower cloud strata; and sunshine, together with thunder, lightning, halos, auroras, meteors, &c. In addition to the regular observations, Mr. Omond is to conduct physical inquiries into the hygrometry of this boreal climate by an instrument specially designed by Prof. Chrystal; inquiries as to the direction and speed of the wind and optical phenomena by instruments specially designed by Prof. Tait; and inquiries as to the best modes of conducting the observations under the special difficulties presented by the climate of Ben Nevis.

All the hourly observations will be extended on a daily sheet, three copies of which will be made, one for the Observatory, and two for the Scottish Meteorological Society, one of which will be sent to the Scottish Meteorological Council, London. Forms have also been supplied for monthly summaries of the observations. It has further been arranged that a series of similar observations at 8 and 9 a.m. and 2, 6, 9, and 10 p.m. be made at Fort William by Mr. Colin Livingstone, one of the Scottish Meteorological Society's observers.

A Redier's continuously-recording barograph and a Richard's continuously-recording thermograph have been supplied to the Observatory, and also to Mr. Livingstone, to be used as interpellation instruments. By the double set of hourly observations thus obtained, comparisons may be made between the atmospheric conditions on the top of the Ben and those at sea-level, which are of such